FRACTURE OF BASE OF SKULL.

ANALYSIS OF 530 CASES, WITH PARTICULAR REFERENCE TO TREATMENT AND PROGNOSIS.

BY L. R. G. CRANDON, M.D.,

OF BOSTON, MASS.,

Assistant Surgeon, Boston City Hospital.

AND

LOUIS T. WILSON, M.D.,

Formerly House Surgeon, Boston City Hospital.

FROM June 1, 1864, to September 1, 1906, the surgical records of the Boston City Hospital show 530 cases of fracture of the base of the skull. The total fractures of all kinds treated, both in the hospital and as ambulatory cases in the out-patient department, is 35,816. Fracture of the base of the skull stands ninth in frequency; this number, of course, represents only those which came to the hospital alive. Many of these cases never come under treatment, because the other injuries to the brain suffered at the same time cause immediate death.

By the courtesy of the staff of the hospital we have been able to analyze these cases. After finishing this study we are convinced that it has been worth the time, because (1) we found that the records of these particular cases are well kept in detail; (2) the number of cases is large enough to give a fair idea of the frequency of symptoms; (3) certain conclusions as to treatment and prognosis seem to be warrantable.

SUMMARY:—FRACTURED BASE OF SKULL; BOSTON CITY HOSPITAL.

May 24, 1864, to September 1, 1906.

Total number of fractures	35,816
Total number of fractured skulls	1,436
Total number of fractured base of skull	530
Number of fractured bases which recovered	299
Number of fractured bases which died	231

Hæmorrhage.	*Lived.*	*Died.*	*Total.*
Number of cases having hæmorrhage.	214	181	395
One ear	170	111	281
Two ears	16	31	47
Mouth	17	27	44
Nose	73	95	168
Subconjunctival	32	21	53
Pupils.			
Equal	212	69	281
Unequal	65	90	155
Dilated	17	57	74
Contracted	5	15	20
Reaction normal	272	70	342
Reaction slow	16	30	46
Reaction absent	11	131	142
Knee-jerks.			
Normal	204	17	221
Absent	15	24	39
Unequal	10	1	11
Increased	8	21	29
Diminished	8	22	30
Paralysis.			
Face	31	15	46
One limb	3	10	13
One side	5	36	41
General spastic	1	13	14
Ptosis without facial paralysis	5	0	5
Nystagmus	7	6	13
Strabismus	12	13	25
Exophthalmos	6	8	14
Alcohol	106	64	170
Respiration stertorous	11	106	117
Operation	28	31	59
Conscious	201	97	298
Unconscious	98	134	232
Vomiting	36	42	78

Average stay in hospital, died	2½ days
Average stay in hospital, lived	16 days
Average stay in bed of living	10 days

Causes.—Of the 530 cases here summarized, 231 or 44 per cent. died. Eighty per cent. of the cases received the injury by falling, at least half of them only in falling backwards from a standing posture; the remaining 20 per cent. were injured by assault or some other form of external violence.

Alcohol, to an intoxicating degree, was found present in 170 cases, or 32 per cent.; this must be noted as amongst the contributory causes. Of this number 64 cases or 38 per cent. died. Of the alcoholic, many died with delirium tremens, which could not be wholly differentiated from symptoms of laceration or meningitis.

Consciousness.—Two hundred and thirty-two cases or 44 per cent. were noted as unconscious at first examination. Of the conscious ones, fully half, or three-quarters of the whole number of cases, were dazed or stupid, or could be roused only with considerable effort; 58 per cent. of the unconscious died, while 33 per cent. of the conscious died. We are warranted to conclude, therefore, that loss of consciousness, in itself, has little bearing on the matter of prognosis.

Neither depth nor prolongation of primary unconsciousness is in itself a measure of danger. Phelps observes that it is not unusual for complete loss of consciousness to continue for some days without concomitant or subsequent symptoms of special severity. The loss of consciousness which occurs at a later stage is of serious significance, showing increase of cerebral œdema, continuous hæmorrhage, or meningeal inflammation.

When delirium appeared early, in most cases, it was due to the effects of acute or chronic alcoholism. It always signifies circulatory disturbance, but when it appears late this disturbance is produced by infection.

To the remote effects on mentality we shall refer later.

Deformity.—Absolute change in contour of the skull was practically never seen, unless the fracture also involved the vault.

Scalp Wounds.—Scalp wounds were present, of course, in a large number of cases, and served in a measure to guide one to the site of the primary blow. Scalp wounds whether connected with the basal fracture or not should be thoroughly cleaned and closed. If pus develops in the ear, or if the patient lives to develop basilar purulent meningitis, radical operation, for the purpose of drainage, should be attempted.

Ecchymosis.—Ecchymosis directly after the injury may, of course, appear at the site of contusion and have no relation to the basal fracture.

Ecchymosis appearing two to ten days later is most commonly observed behind the ear, particularly behind the ear which had shown bleeding; another common site of ecchymosis was the upper eyelid.

Hæmorrhage.—In our total of 530 cases, 395 or 74 per cent. had hæmorrhage from at least one orifice.

Bleeding from one cranial orifice is the commonest symptom of fractured base; bleeding from one orifice is the usual condition; bleeding from two, much less frequent. The order of frequency is: One ear, 281; nose, 168; sub-conjunctival, 53; two ears, 47; mouth, 44.

Ears.—Bleeding from at least one ear is the pathognomonic sign of fractured base in common practice. Walton[1] in his 50 cases found that "bleeding from one or both ears was noted in 21 cases. In three cases it was described as profuse, and in one case as persistent. In none of these four cases was middle meningeal hæmorrhage found on autopsy; nor, indeed, evidence of rupture of any of the large vessels, either arterial or venous; conversely, middle meningeal hæmorrhage was found in nine cases, in eight without bleeding from the ear, in one with slight bleeding." Hæmorrhage from the ear does not, of course, necessarily imply the existence of a basal fracture, but practically if the hæmorrhage is severe it must come from the mucosa of the drum, or the middle ear, and hence must mean bony injury.

As a matter of fact, in practically all cases in our records where careful aural examination has been made with the head mirror, rupture of the drum has been found. Rawling[2] has observed that bleeding from both ears is a much more serious sign than from one, though this difference seems to be less true in children.

It was formerly advised to irrigate the auditory canal in cases with bleeding from the ears. This is no longer to be recommended, for the same reason that irrigation is no longer used in many surgical procedures, namely, that by it septic outside matter may be washed into deeper recesses. The external ear and canal should be thoroughly cleaned by wet wiping, and the external orifice closed by a bit of sterile or corrosive cotton, but the ear should not be tamponed.

Nose.—In 126 cases where bleeding from the nose was noted probably a great proportion were suffering from injury to the nose itself, not basal fracture connecting with the nasal cavity.

This symptom is of little value in diagnosis or prognosis unless the persistency is notable.

Mouth.—Bleeding from the mouth must be investigated with great care in each case, to rule out its origin from wounds of the tongue or lips.

Pharyngeal hæmorrhage has been observed by us in 44 cases, of which 27 cases or 61 per cent. died. Fracture of the base which extends in such manner as to tear the mucosa of the pharynx must approximate the median line. It implies great force to cause it, and the mortality is very high. Autopsy in these cases shows that the fissure has passed through the pituitary fossa and that the mucoperiosteum of the under surface of the body of the sphenoid is torn. Von Bergman had one case where so much blood entered the air passages from the fracture opening into the nasopharynx, that tracheotomy was done and saved the patient's life.

Sub-Conjunctival.—Blood under the conjunctiva, when due to basal fracture and not to direct injury to the eye, implies fracture to the roof or outer wall of the orbit, but is not pathognomonic. On this point Walton[8] remarks: "Sub-conjunctival hæmorrhage led in one case to the diagnosis of basal fracture, not confirmed by autopsy. This will serve to remind us that sub-conjunctival hæmorrhage is no infallible sign of fracture other than fracture of the outer wall of the orbit."

Pulse.—The rapidity of the pulse in our cases seems to be of little importance apart from general surgical principles. The quality is of greater value, serving as an indicator of the general condition and successive observations showing the effect of hæmorrhage or other changes in condition. Phelps[4] observes that in general, the normal or full pulse is equally characteristic in fatal and recovering cases. The failure of cardiac force is neither more nor less threatening in this than in other forms of injury.

Respiration.—Respiration seems to have little significance, unless it be in the primary shock or toward the fatal termination. It was noted as being stertorous in 117 cases, of which 106 died. Phelps[5] concludes that the irregular respiratory rhythm indicates a dangerous intracranial pressure, and an extremely infrequent respiratory act means probably a fatal injury to the medulla.

Temperature.—A sub-normal temperature seemed to indicate great shock, or alcoholism; most of the cases had normal temperature, and a few on entrance had elevated temperature. Of those that had high initial temperature nearly all died.

Phelps[6] states that in uncomplicated hæmorrhage the temperature ranges from normal to 100°, but if cerebral contusion is well pronounced 101° may be reached. Cerebral laceration is characterized by higher initial temperature, and, when severe, by an early and rapid progressive increase. Our cases confirm his observation, that persistent depression of the temperature measures the danger from primary shock, unless due to alcohol, and that its rapid rise later gauges the severity of meningeal or cerebral lesion.

Proptosis Oculi.—Exophthalmos, due to blood in the orbit, is mentioned by Rawling as a rare complication. It has been observed by us several times in the most serious cases, but very rarely in cases that got well. As a rule, it has been accompanied by chemosis.

The Escape of Cerebro-Spinal Fluid.—The escape of serous fluid from ear or nose was not noted in more than 27 cases, though other writers speak on the subject to great length as if it were common.

Flow of cerebral fluid from the ear means fracture in the middle fossa, laceration of the petrous portion and its dura, into the sub-arachnoid space. It may rarely mean the posterior fossa, but fracture here, to allow fluid to escape, must tear the facial nerve and the tubular prolongation of the arachnoid round it. Hence flow from the ear without facial paralysis means fracture of the middle fossa.

Elaborate chemical tests have been devised to recognize cerebrospinal fluid, but these are complicated and unnecessary. This fluid may be diagnosticated, as Rawling[7] puts it, if it begins to come from the ear within twenty-four hours, is practically colorless and continues some days. Tympanic excretion is cloudy, small in amount, and usually appears not until at least twenty-four hours after the injury. Rawling quotes Sir William Savory's case where this cerebro-spinal fluid poured for a month; and another from Sir William McCormack where three pints were collected in five hours. This flow from the nose is very rare, though it is said to come from the Eustachian tube when fracture enters the ear without rupture of the tympanum.

Pupils.—By referring to the table above it may be seen that statistics on the relation between pupils and basal fractures can be made to lend themselves to every and all theories. In short, pupillary condition is only a general aid in diagnosis or prognosis. Thus, in 142 cases without reaction, 131 died; this probably is the most striking result of the study of pupils. Nichols[8] similarly reported that in 54 cases of head injury, with non-reacting pupils, 47 died, and that in 24 cases diagnosticated as basal fractures all were fatal.

In 46 cases described in our records as " reaction slow," 30 died. On the other hand, in 155 cases where the pupils were unequal in size only 90 died, but where both were dilated or contracted, in a total of 94 cases, 72 died. If any conclusions then are warrantable they are that loss of mobility of the pupils is far more grave than mere inequality, such as may result from temporary irritation.

On this question Walton[9] concludes, "Doubtless various factors play a part in producing the altered pupils in this lesion, but if disorder of any simple mechanism is to be credited with the production of the Hutchinson pupil or other pupillary changes noted, the only lesion worthy of this place is disturbance, irritative or paralytic, of the intracranial fibres of the ciliospinal tract. This tract after leaving the cervical sympathetic passes into the base with the carotid plexus, thence forward by the ophthalmic division of the fifth and its nasal branch, having first passed over the Gasserian ganglion. The fact is established that irritation of this tract causes dilation, and its destruction, contraction of the pupil. This tract is peculiarly susceptible to injury at the apex of the petrous bone."

Paralysis.—Contrary to the impression to be obtained from many writers, we have found paralysis of the cranial nerves relatively uncommon, and our knowledge on the subject is largely obtained from Rawling's Hunterian Lecture.[10]

PARALYSIS OF CRANIAL NERVES.

1. *Olfactory Nerve.*—This nerve is involved in fractures of the orbital plate, but immediate loss of smell due to injury to the nerve is difficult to determine, because in such a case the nose is blocked with blood at first. It is fair to say that loss of smell at first is fairly common, but permanent anosmia is very rare.

2. *Optic Nerve.*—Immediate loss of sight from fracture of the base, in cases which are able to tell of it, is a very rare occurrence, because most fractures near the optic foramina tend to pass either between them or external to them through the sphenoidal fissures.

3. *Motor Oculi Nerve* may be injured in the orbit, or be pressed upon by blood, and the prognosis depends on which occurs.

4. *Pathetic Nerve.*—The pathetic nerve is practically never involved alone.

5. *Trifacial Nerve: Ophthalmic Division.*—Pressure of hæmorrhage may cause complete loss of function of one or more branches. Thus complete anæsthesia of both cornea and conjunctiva, with subsequent ulceration, has been observed. The maxillary divisions of the fifth nerve are rarely involved, though the Gasserian ganglion has been injured in fracture.

6. *Abducens.*—Injury to this nerve is not due to blood but to actual injury, the injury occurring where the nerve runs along beside the sella turcica.

7. *Facial Nerve.*—The facial nerve is more commonly involved than any other, because of its passage through the petrous portion. Kohler found 22 cases out of 48; Battle found 15 in 168; Bidwell found 15 in 106 cases; Rawling found 24 in 60 cases; and we find 46 in 530 cases. In our 46 cases it was present in only two or three cases at the time of entrance, but generally came on from three to six days after the injury. The paralysis seemed to be of short duration; most of the cases having recovered, or almost so, at the time of their discharge from the hospital.

8. *Auditory Nerve.*—Facial paralysis is practically always complicated by involvement of the eighth or auditory nerve. Injuries to these nerves Rawling divides into two groups: (1) Early and partial paralysis of the facial nerve accompanied by a variable degree of deafness; (2) early and complete paralysis of the facial nerve accompanied by complete deafness.

Undoubtedly, many cases of slight facial paralysis, clearing up later, are unobserved in these cases, because of the predominant importance of other symptoms. In most cases the facial affection is due to pressure from blood-clot; this is absorbed, and recovery is complete. Deafness frequently recovers unless the ossicles are severely damaged, or in the second class of cases when the whole inner auditory apparatus is shattered by fracture.

9, 10, 11 and 12. *Vagus Nerve.*—Rawling refers to four cases where sudden dyspnœa or other symptoms have occurred when subsequent examinations have showed injury to the vagus nerve as it passed through the jugular foramen. Injuries to the hypoglossal nerve have not been recorded.

Skeletal Paralysis.—Paralysis of one limb, one side, or general spastic paralysis, has been occasionally noted in our records. Such paralyses usually mean complicated cerebral injury, and practically all of them die.

Paralysis of Bladder and Rectum.—These paralyses in basal fractures have little value in diagnosis or prognosis. In injury to the cord the bladder fills up almost indefinitely, but in cerebral injury, after a certain moderate stage of distention, the bladder will empty itself. Retention in both bladder and rectum, though it sometimes occurs in hæmorrhage, is not indicative of the nature of the lesion, but is merely a result of the unconscious state however produced.

Loss of fecal and urinary control of cerebral origin, persistent after the return of consciousness, means laceration regardless of the region of the brain involved.

Reflexes.—Nothing apparently of value is shown by our records of condition of the reflexes on these cases. Thus, in 221 cases where they were normal, 17 died; in 39 cases noted as without reflexes, 24 died. The signs of Kernig and of Babinski have not been noted over a sufficient number of years to be of value in our records. In general, increased or diminished knee-jerks, other things being equal, have a bad significance. Walton[11] says: "The reflexes (excepting the cremaster) may be wanting immediately after cerebral trauma, only to become extremely active within a few hours. Whatever lesson is to be drawn from the reflexes in these cases, it should not be regarded as specially diagnostic of basal fracture, but as resulting from violent jarring of the intracranial contents, accompanied perhaps by local bruising and by hæmorrhage, either limited or extensive."

Vomiting.—Because of the frequent presence of alcohol, in these cases, the significance of vomiting is almost nothing. It may signify only general cerebral contusion, or actual injury to the floor of the fourth ventricle. In 57 cases, 25, or 44 per cent., died.

Operative Treatment.—Out of the 530 cases of fractured base, 59 were operated; of these 31, or 53 per cent., died. In studying over these operative cases there seems to have been two reasons for operative intervention: definite signs of hæmorrhage, and a belief that hæmorrhage might be present.

In few of these cases there was found a rupture of the middle meningeal artery, with more or less blood-clot and compression of the brain substance. In the remainder nothing relievable was found on opening the skull.

The question arises as to what class of cases demands operative intervention.

It seems to us that only those cases should be trephined in which hæmorrhage seems to be the most important part of the clinical picture and the history of the case or the course of it under good observation has been one showing continuous and progressive intracranial compression.

The patient with non-reacting pupils even if they are unequal, the patient unconscious with stertorous respiration, nearly always is bleeding from the anterior cerebral artery or some similar vessel deep in the brain substance, blood welling up from the dura, impossible to stop.

Operating on these hopeless cases brings only discredit to surgery, unless the friends of the patient clearly understand the small chance of relief following operation and, so understanding, request it.

Immediate Prognosis.—Death occurring within a very short time results directly, in full 50 per cent. of these cases, from laceration of the brain and attendant hæmorrhage. The liability of laceration along the base is particularly great, on account of the many irregularities of the basal surface. Walton[12] states: " In studying these records one finding impressed itself upon me which, so far as I am aware, has not been sufficiently noted, viz., the frequent disintegration of the under-surface of the frontal lobes posteriorly, and the under-surface of the temporal-sphenoidal lobes anteriorly, that is, the region of the fissure of Sylvius. This can only be due, it seems to me, to impact of these regions against the lesser wing of the sphenoid, which fits into the fissure of Sylvius to separate these lobes."

Patients with fractured base are in the most critical time during the first forty-eight hours.

The matter of immediate prognosis is most ably summarized by Phelps[13] thus: "The probability of the existence of particular lesions, based on their known frequency and the estimation of their relative danger, will have a certain prognostic value. The uncertainty which attends the issue of traumatism is great, not only at the beginning, but at a later period when recovery is apparently assured. The immediate danger is to be measured by the profundity of shock, the depression of temperature and the involvement of the pulse, and in some instances by the visible injury: but reaction is still possible under conditions which seem to be hopeless. The question of prognosis, which more seriously involves the judgment of the surgeon, arises with the passing of the initiatory stage."

Although, as has been noted, prolonged primary unconsciousness may mean nothing, if, during it, the pulse, temperature or other symptoms do not improve, or become more unfavorable, the unconsciousness may be considered very serious.

The matter of prognosis from day to day is not one that can be expressed at any stage with exactness, but is one that must depend upon the surgical sense and experience. Phelps[14] closes the discussion of the subject thus: "There is no class of injuries in which the issues are at all times so uncertain and so surprising. The cases which in their early days present the mildest symptoms and seem most destined to unobstructed recovery, may at some later period assume a threatening and alarming character and perhaps prove fatal in the end; as others in which the combination of symptoms long justifies the gravest apprehension, may eventually terminate not only with preservation of life, but with perfect restoration of long-disordered or suspended function." There are evident lesions so extensive or symptoms so clearly desperate, that a fatal end is unquestionable; but no condition can be so favorable as to assure recovery.

The prognosis must be in general not only guarded, but subject to revision from day to day, until all direct symptoms have disappeared, and temperature has been for a length of time practically normal.

Remote Prognosis and After-Effects.—The lesions of the subjective centers in the frontal lobes are frequently indicated in recovering cases by the existence of motor sensory aphasia. Delusion, loss of memory, defective judgment, and mental decadence indicate, in most cases, laceration. This has been demonstrated by conjoined clinico-pathological observation to involve the left frontal lobe.

One of the remote after-effects of fractured base, and indeed even of cerebral contusion, seems to have been little noted in the literature. We refer to the changes in character and disposition. It is not possible from the nature of this kind of change to be able to reach definite statistics or details concerning it: in a large number of cases partly because the patient and his closest friends are tempted to cover it, and partly because those who are not his friends might exaggerate it. There seems, however, to be but little doubt in a number of cases where we have been able to meet the patient, or talk at length with his friends in a perfectly sympathetic way, with the idea of getting at the whole truth, without asking leading questions, that such changes may take place in any injury of this type.

A considerable amount of our work has been directed to investigate the remote after-effects and final results in these injuries. Where personal interviews were not possible we have endeavored by correspondence to learn the present condition, and these are types of the replies:

"I received your postal card in regard to my injury of April 12, 1900. Would say my memory has been very poor since the accident; I have had to give up work more or less."

"In replying for Mr. T. J. S., it should be stated that he has complained to me on all occasions that he is troubled much with headache and with his eyes, and that his chief troubles at present are dizziness, which he says is very persistent, and deafness, which is very marked. It seems to me personally that he is growing worse in this connection, for he complains very much of a buzzing noise in his left ear, which he says annoys him almost constantly.

"He does not use alcoholic drinks to any extent. Bright sunlight affects his eyes while driving; he has always been a coachman and is still engaged in that business, but does not work without considerable difficulty and embarrassment.

"He says it was about nine weeks after he left the hospital before he went to work, and then he began by degrees.

"He is not troubled with paralysis, fainting spells, or fits."

"My husband received a postal from you, asking him to let you know about his health since he was in the hospital with a fractured head.

"He has not been well since, and he could not go away for five months after coming out of the hospital, and he can't stand working so long as he did before he was sick. For two months there was a running out of his right ear, and he is deaf now in that ear, and the sight of his right eye is 'most gone.

"When he drinks I can see a great difference in him; he gets 'most crazy; also when he is sober I get afraid of him, the way he swears and loses his temper for just no cause. He has had fits four times."

An attempt was made to find the most accessible 200 of our 530 cases, but the population from which a municipal hospital draws, and the kind of people that most commonly receive this injury change residence so often, that of this great number only 38 cases could be found. Their replies to specific questions are collected in the following table:

	Yes.	*No.*
Headache	13	25
Eye troubles	17	21
Dizziness	15	23
Deafness	16	22
Paralysis	1	37
Fainting spells	4	34
Fits	2	36
Loss of memory	4	34
Troubled by sunlight	13	25
More easily crazed by alcohol	6	32
Worked since injury	15	23
Same work since injury	21	17

Eight have not yet worked since injury. Eight and one-half weeks from the time of injury was the average period before going to work, varying between one week and two years.

Inability to work as hard as formerly seemed to be the chief cause of complaint; the patients becoming easily tired and not able to fix their minds on their work as they had been previous to the accident. Seventeen of these cases complained of poor eyesight where previous to the accident their eyesight had been perfectly good. None of them were people who used their eyes to any extent in their work, as they were all laboring men. Fifteen complained of dizzy spells from which they had not suffered previous to the accident, and many of these complained of the effects of bright light which often brought on these dizzy spells. Deafness was also often complained of, sixteen cases being more or less deaf in one ear—the ear in which the hæmorrhage came at the time of the accident. Alcoholic drinks did not seem to have any more effect than previously; only six stating that it did. Wives of the patients, however, state that their husbands are much more irritable and vicious when under the influence of liquor, than they were previous to the accident. Twenty-one are doing the same work in which they were engaged before the accident; seventeen are pursuing a different occupation of a lower grade than before, or no work at all, of which latter there were eight. These patients state that they are not able to stick to their work " on account of their head."

Time in Bed.—The average stay in bed for those who lived was ten days; in the hospital sixteen days. This we believe to be quite insufficient.

As examples of injuries in the course of which too early freedom from restraint was allowed, the following are quoted:

CASE I.—J. S., thirty-two, single. April 27, 1899. Five hours ago struck on the head by a brick. Alcoholic, conscious, rational. Bleeding from left ear and three cuts on top of head, which on examination shows no fracture of skull. Large hæmatoma behind and below left mastoid process. Reflexes all present. Pupils dilated, but react. Condition not considered one for immediate operation. Two days later trephined, when a fractured base was found. There were three distinct lines of fracture forming a triangle, leaving a large fragment of bone between the anterior and middle fossæ held in place only by periosteum.

Case II.—J. D., forty-eight, single. July 24, 1901. Four days ago fell 35 feet, landing on some rocks. Taken to another hospital, but discharged from there the next day and walked home. Since leaving the hospital has had severe headaches, pain in back of neck, nausea, dizziness, blurred sight and gradual increasing paralysis of left arm. Good color. Both pupils contracted, but right smaller than left; react slowly. Left shoulder shows marked ecchymosis. Heart slightly enlarged, lungs negative. Left arm, above triceps, and forearm at middle show one inch atrophy; marked atrophy of left deltoid; left hand grasp diminished; hand limited in extension, as though due to contraction of flexors; hand can be flexed, but not extended.

August 9.—Patient was discharged to the Nerve Out-Patient Department. While in hospital patient complained of occasional headaches and was markedly irritable at times.

Case III.—W. C. March 7, 1904. Four days ago, while drunk, fell down the cellar stairs. Friends say that at that time there was bleeding from the nose and mouth. Was put to bed. For the past two days has headache, vomiting, increasing deafness and mild delirium at night, but by day has sat up. Conscious; pupils contracted; react to light and distance. Left ear shows redness of drum and depression of upper part of auditory meatus. Tongue protruded to right. Marked rigidity of right lower extremity; knee-jerk present; left exaggerated; no ankle-clonus. Patient became unconscious shortly after entrance. Right pupil became dilated, but both react. Respiration became stertorous, Cheyne-Stokes in character. There was no evidence of localized cerebral lesion. Died two days after entrance.

Case IV.—G. H., fifty-two, married. April 26, 1903. Today, while drunk, fell down elevator shaft, two stories. Taken to Relief station. Examination shows hæmorrhage from mouth, but none from ears. Right pupil smaller than left; both react. Reflexes normal. No paralysis. Refused to be treated, and left, against advice. Four days later walked into the hospital. Mildly delirious. Left pupil larger than right; both react slowly. Knee-jerks normal. Right Babinski, marked double Kernig. Some stiffness in the neck. Temperature and pulse gradually rose;

patient became delirious, finally sinking into a stupor, and succumbed forty-eight hours after having been admitted to the hospital.

CASE V.—F. R., thirty, single. June 14, 1902. Friends state that four days ago patient fell from his bicycle, injuring back of head; wounds dressed at home by a physician. Patient up and about, appearing perfectly well, when suddenly to-day became delirious, requiring restraint. Brought to the hospital. Unconscious. Pupils react; divergent strabismus; right eye apparently the one affected. Pulse, good volume. Respiration stertorous. Right facial paralysis. Supra-orbital pressure causes free movements of arms, legs and face, but response greater in the left side than in the right. Abdominal, cremasteric and knee-reflexes present; no ankle-clonus; double Babinski. In upper part of occipital bone, median line, is a depression size of a nickel, apparently old. No bleeding from ears, nose or mouth.

June 15.—General condition has failed. Operation advised. Horse-shoe flap, right temporal region, vertical fracture near occipital end of wound running down the base, thin extra-dural clot, brain pulsating. Opening enlarged backwards, large extra Patient stood operation poorly and succumbed to death in a few hours.

CASE VI.—D. C., fifty, married. June 30, 1904. Six weeks ago was struck on the back of head by iron bar and was treated at the relief station for scalp wound, at which time there were no symptoms of fractured skull. Refused to stay in hospital. Since accident patient has had continued frontal headache; pain with dizziness; pain with vomiting without reference to meals; has grown markedly nervous and irritable. Says his sight has grown dim and his hearing is poor. Unable to sleep for the past two weeks; has felt drowsy most of the time.

Physical examination negative, except for diminished knee-jerks. Ears and eyes negative. Patient was in the hospital thirty-seven days, twenty-four of which were spent in bed. For two weeks patient was mildly delirious at night and drowsy during the day. This condition gradually wore off, and the patient was discharged, relieved, to the Nerve Out-Patient Department. (There is no positive sign that this case was more than cerebral contusion, but we believe our conclusions (*vide infra*), nevertheless, cover it.)

The cases here cited have been personally observed by us. In each one there is apparently warrant for the belief that the patient would have done better if he had been in bed under the right conditions from the time of the injury.

Case VII.—April 10, 1900, P. H., a soldier, from a harbor fort, was found on the sidewalk after a fall from assault or accident. Unconscious; bleeding from left ear, hæmatoma behind it; left pupil larger than right, but both react sluggishly; no paralysis. Consciousness returned in a few hours, bleeding stopped, the pupils became normal, and the patient was quite without symptoms on the third day. On the fifth day, against advice, patient insisted on leaving the hospital, boarded the steamer and got to the fort, stepped ashore there and dropped dead. Autopsy showed a fracture of the base; details not obtainable.

This case alone, it seems to us, is enough to warrant the contention that fracture of the base should at least be treated with the conservatism which goes with the care of other fractures. Although these fractures are not open to the eye or the finger, they are even more liable to mobility and consequent injury of delicate adjacent parts than are fractures of the skeletal bones. Although fixation of basal fractures is not possible by any accurate application, because in the first place the line of fracture is not known, and in the second place may extend in several directions, it is nevertheless presumptive that a patient in bed would be less liable to jar or other kinds of force which might stir up the fracture or dislocate clots.

We, therefore, strongly urge as routine treatment in all cases of even suspected fracture of the base of the skull, rest in bed for full three weeks. Such a patient ought to be in a separate or small, dimly-lighted room, where little can attract his attention. He should have a single low pillow, or none, as he prefers. He should have as few visitors as possible, should take nourishment still lying down, and have practically nothing to attract his attention or to cause any excitement. Food should be easy to digest, cathartics should be used freely to prevent the least strain at stool, which causes cerebral congestion. Headache should be controlled by whatever sedative seems to work best in the given case and used even to an extent to keep the patient more or less somnolent.

This utmost conservatism in the care of these cases must help to prevent startling deaths such as have been here described. Treatment which only keeps the patient in bed till his whim demands that he get up is not rational or careful treatment. The fracture exists even if the patient feels perfectly well. A bone will not heal in three days.

REFERENCES.

[1] ANNALS OF SURGERY, 1904, Vol. xlii, p. 654.

[2] Lancet, 1904, i, p. 1097.

[3] *Loc. cit.*

[4] Traumatic Injuries of the Brain and its Membranes. New York, 1897, p. 176.

[5] *Loc. cit.*, p. 203.

[6] *Loc. cit.*, p. 201.

[7] Lancet, 1904, i, p. 1079, *et seq.*

[8] B. C. H. Med. and Surg. Reports, 1895.

[9] *Loc. cit.*, p. 662.

[10] Lancet, 1904, i., p. 1097.

[11] *Loc. cit.*

[12] *Loc. cit.*, p. 564.

[13] Traumatic Injuries of the Brain and its Membranes, New York, 1897, p. 201.

[14] *Loc. cit.*, p. 203.